

NATIONAL LEAD COMPANY
PERTH AMBOY PLANT

WHITE ARSENIC OPERATION

Some years ago when we had orders for large tonnages of shot metal, first at Katwan and then at Perth Amboy, arsenic was introduced into the antimonial lead using a mixture of white arsenic and crude oil. When the contract for this metal expired, the use of white arsenic seemed to fade out as the alloys requiring arsenic were few. Black or metallic arsenic replaced the white arsenic in the alloys. Perhaps at that time the health problem was the main contributing factor to the changeover as well as the diminishing arsenical lead alloys, for sanitary conditions were very hazardous.

In recent years, more and more arsenical lead alloys are being made; so the use of black arsenic at fifty-six cents a pound became prohibitive. About the time the SOP for using white arsenic and charcoal was received, the lid was clamped down on the use of black arsenic, as it most decidedly should have been.

Using the SOP practically to the letter, we make a king alloy which is used in ~~adjustments~~ for all arsenical antimonial lead requirements.

The white arsenic and 80 mesh charcoal are mixed in the proportion of 200 pounds white arsenic to 35 pounds of charcoal in a metal mortar box, the mixture being stored back into the wooden kegs and covered until ready for use.

This is done just outside the building on a covered platform out of the working area rather than at the location where the metal is made. We believe this to be more efficient as it can be mixed during spare hours so the operator can remain close to his operation when making the king alloy instead of going for materials and bringing same to location of pot to be mixed. Besides keeping as much contamination as possible out of the area where others work there is a definite lack of space at the pot area.

Not only would others working in the area be subject to the arsenical dust but the operator would have double exposure at the same time, that of mixing and that of charging.

The king alloy is made in a 35-ton kettle.

After the metal is cleaned it is heated to 1000-1050°F and the mixture fed into the vortex, adding at the ratio of about 2200-2500# per eight-hour shift. When this metal is being made, we have men around the clock so the operation is continuous and the alloy can be made in the least amount of time in order not only to release the pot but so there are fewer exposure hours when others are working in the area.

As the arsenical slag forms, it is removed two or three times



during the alloying of a 7% alloy.

The metal is cast at 900-950°F using a banjo. There are 96 moulds in the "U" shaped casting bench.

When we first started to use the white arsenic and charcoal we made several pots shooting the fumes into the sanitary system and out a stack into the atmosphere. Complaints by the men were frequent in the outside area and also within the building. A Sly Baghouse was installed which works very well, provided the mixture is not added above the designated amount and provided the bags are shaken frequently. To offset the latter, automatic timers were installed which shake the bags one-half minute every hour. This removed the human element that existed before. Experience may change this timing.

After the installation of the baghouse, several tests were made to determine how much white arsenic was being reclaimed so that the expense could be justified from the saving as well as from minimizing the existing hazard. In each test the bags were thoroughly shaken and the baghouse spark arrester and flue were cleaned out before the start of the operation. All white arsenic added was weighed and recorded as was all white arsenic removed during and at the end of the operation.

In the first test the reclaimed white arsenic was white in color, indicating little charcoal. In the four following tests it was off-color, bordering on a light gray. When reusing the white arsenic, any charcoal present is ignored when mixing for future use.

In order to secure an arsenic balance, the resulting metal, slag and reclaimed white arsenic were analyzed.

In test #2 we learned that the white arsenic was added too fast infrequently rather than at a steady feed. We attributed the increase in reclaimed white arsenic to this factor.

Experimenting along different lines, we made a third test dropping the rate of feed from 2200-2500# to 1500-1800# per eight-hour shift, feeding just as steady but smaller amounts at a time. The picture changed drastically, as will be seen in the summary of the figures. Not only was there greater efficiency of arsenic into the alloy, but the recovery of white arsenic dropped down and the quantity of slag increased which meant more by-product.

We tried to repeat these findings in test #4 by following through with slow feeding and, although the reclaimed white arsenic was low in comparison with tests 1 and 2, the efficiency of arsenic in the metal dropped and the slag increased greatly.

You will note in tests 1, 2 and 3, the arsenic content of the metal was under 8% while in test #4 it was carried to nearly 10%.

Assuming the increase in slag was due to slow feeding and

prolonged operation and assuming the most efficient point to stop the operation may be about 7%, we reverted to fast feeding. Also to cover the other angle, the slag was removed when the king alloy contained 7.45% arsenic. This slag weighed 4165 pounds. More white arsenic was added, the final metal being 9.25%. The slag from 7.45% to 9.25% weighed 2250 pounds.

The tin in the first three tests was removed by oxidation before adding arsenic, while in tests 4 and 5 the tin was removed with the arsenical slag. The blast furnace lead used in test #5 had .75% tin due to contamination from a tinny run which preceded this metal; thus the large quantity of slag in this column.

There is nothing conclusive in these figures, but we believe fast feeding and stopping at 7-7.5% arsenic to be the most economical procedure. Additional tabulations and tests will be made to further our knowledge and control of making king alloy.

There are plans in the making for either a blender to mix the white arsenic and charcoal or a hood connected to the Sly Baghouse under which the white arsenic and charcoal will be mixed in the mortar pan.

Attached to this paper are the figures of the estimated savings effected by reclaiming white arsenic in the baghouse. The estimated 1956 reclaimed savings in the baghouse were based on the first two tests only as they were the only ones completed at the time.

In conclusion may I state that even if the estimated savings from reclaimed white arsenic should drop to 50%, the removal of the white arsenic from the atmosphere is definitely the deciding factor for the installation of a Sly Baghouse and I further recommend automatic shakers.

| Test No. | Pounds White Arsenic Used | Available Arsenic @ 75.73% | RESULTING METAL | | Percent Available Arsenic Recovered in Baghouse | DETINNED SLAG | | | ARSENICAL SLAG | | | Unaccounted for |
|----------|---------------------------|----------------------------|------------------------|------------------------------|---|---|-------------------------|---------------------------|----------------|-------------------------|---------------------------|-----------------|
| | | | Percent Arsenic Pickup | Percent of Available Arsenic | | Weight | Percent Arsenic in Slag | Percent Available Arsenic | Weight | Percent Arsenic in Slag | Percent Available Arsenic | |
| 1 | 9520 | 7209 | 7.90 | 75.29 | 19.31 | Metal detinned before addition of white arsenic | | | 2260 | 12.20 | 3.83 | 1.57 |
| 2 | 9704 | 7349 | 7.70 | 71.03 | 23.25 | " | " | " | 1825 | 13.05 | 3.21 | 2.51 |
| 3 | 7985 | 6047 | 7.60 | 79.79 | 8.63 | " | " | " | 2790 | 18.10 | 8.35 | 1.23 |
| 4 | 10496 | 7949 | 9.87 | 72.11 | 9.86 | 1170 | 2.93 | 0.43 | 8085 | 14.95 | 15.21 | 2.39 |
| 5 | 10325 | 7819 | 9.10 | 70.74 | 14.44 | 3365 | 3.85 | 1.66 | 6415 | 14.10 | 11.56 | 1.60 |

Estimated Recovery of White Arsenic in Sly Baghouse for 1956

Based on one pot per month using figures from test runs where recovered White Arsenic was weighed.

| | | | | | | |
|-----------------------------------|-----------------|---|---|---|---|--------------------------------------|
| White Arsenic per pot | 9520# x 12 pots | - | - | - | - | 114,240# per year |
| White Arsenic recovered | 1914# x 12 pots | - | - | - | - | 22,968# " " |
| Percent recovered | - | - | - | - | - | 20.1% |
| 22968# recovered x 5.5% per pound | - | - | - | - | - | \$1263.24 estimated saving per year. |

1955 - Sly Baghouse used for three pots; so 1955 saving was 25% of \$1263.24, or \$315.81.